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Shih

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(54) **PIVOTABLE TOP BOARD DEVICE FOR A CHAIR**

(71) Applicant: **Deng-Tai Shih**, Tainan (TW)

(72) Inventor: **Deng-Tai Shih**, Tainan (TW)

(73) Assignee: **Gauss Furniture Co., Ltd.**, Tainan (TW)

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A47C 7/70 (2006.01)

(52) **U.S. Cl.**
CPC ***A47C 7/70*** (2013.01)

(58) **Field of Classification Search**
CPC A47C 7/70; A47C 7/68; A47C 7/705
USPC 297/162, 160, 161
See application file for complete search history.

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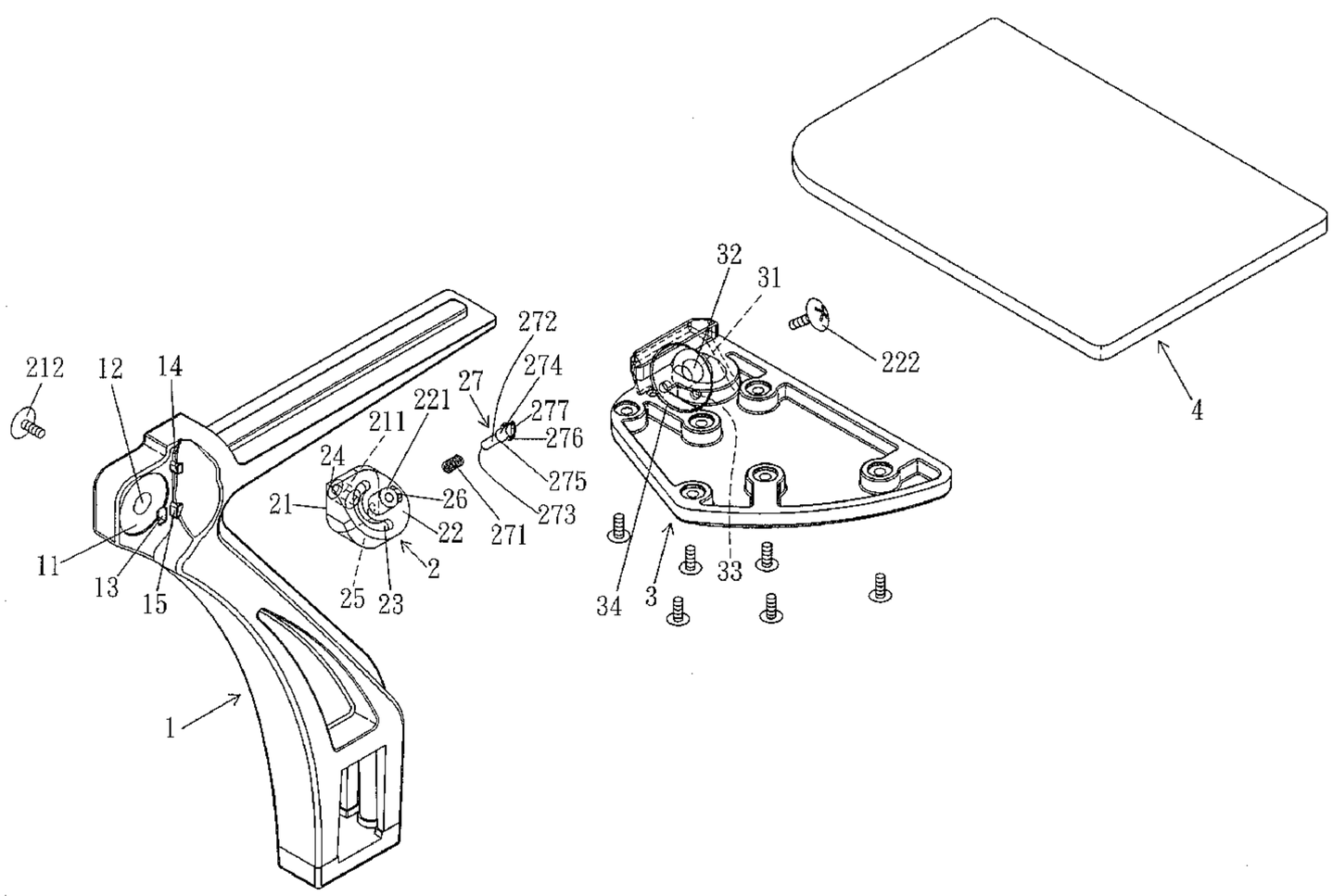
Primary Examiner — Mark R Wendell
(74) *Attorney, Agent, or Firm* — Alan D. Kamrath; Kamrath IP Lawfirm, P.A.

(57) **ABSTRACT**

A pivotable top board device for a chair includes an armrest having a coupling face with a first positioning hole. An axle block includes a first coupling face and a second coupling face. The first coupling face of the axle block is pivotably coupled to the coupling face of the armrest. The axle block further includes a through-hole extending from the first coupling face through the second coupling face. An operation rod longer than the through-hole is received in the through-hole and includes a first positioning end for disengagably engagement with the first positioning hole of the armrest and a second positioning end. The second coupling face of the axle block is pivotably coupled to a coupling face of a coupling board fixed to a top board. The coupling face of the coupling board includes a second positioning hole releasably receiving the second positioning end of the operation rod.

4 Claims, 11 Drawing Sheets



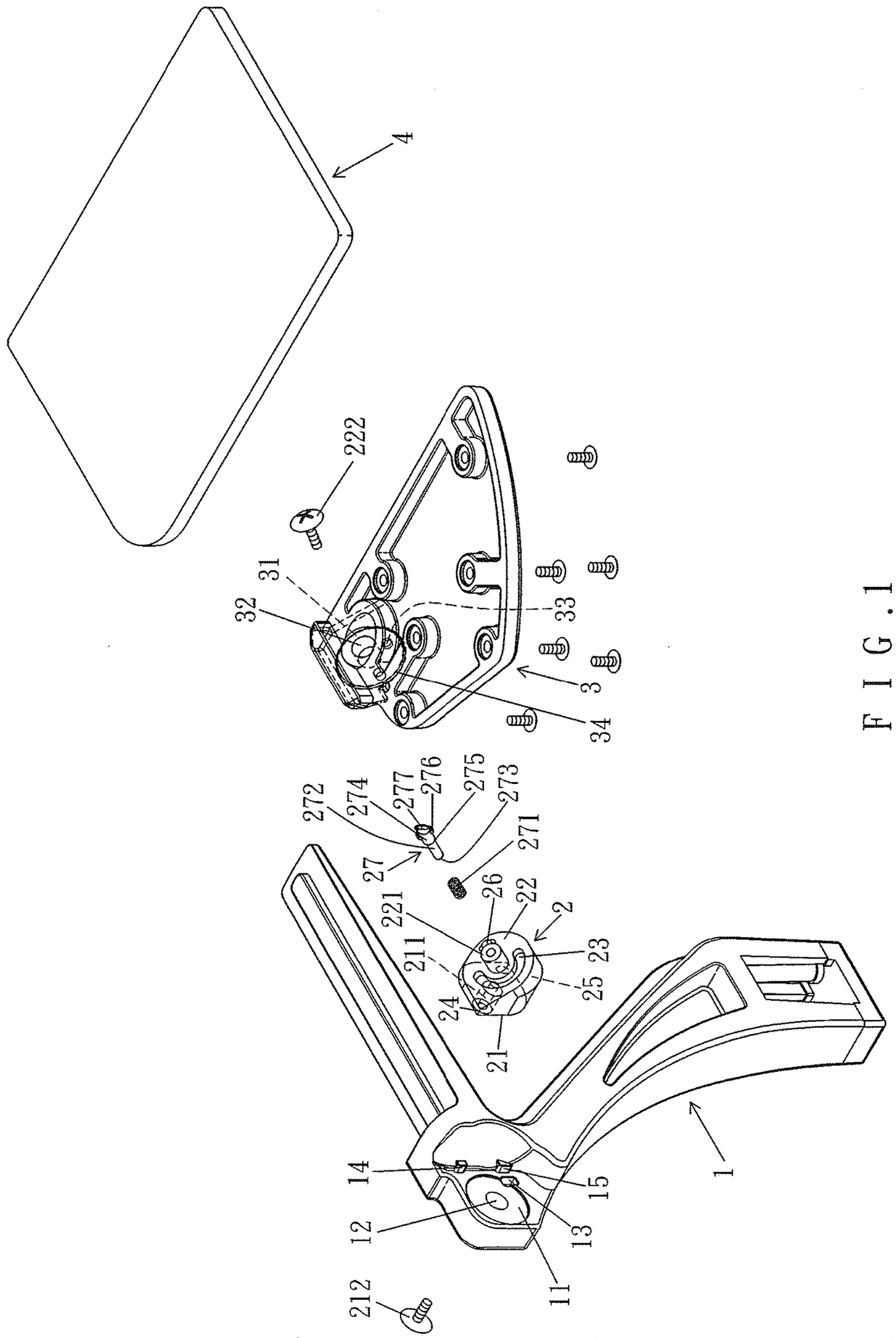

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FIG. 1

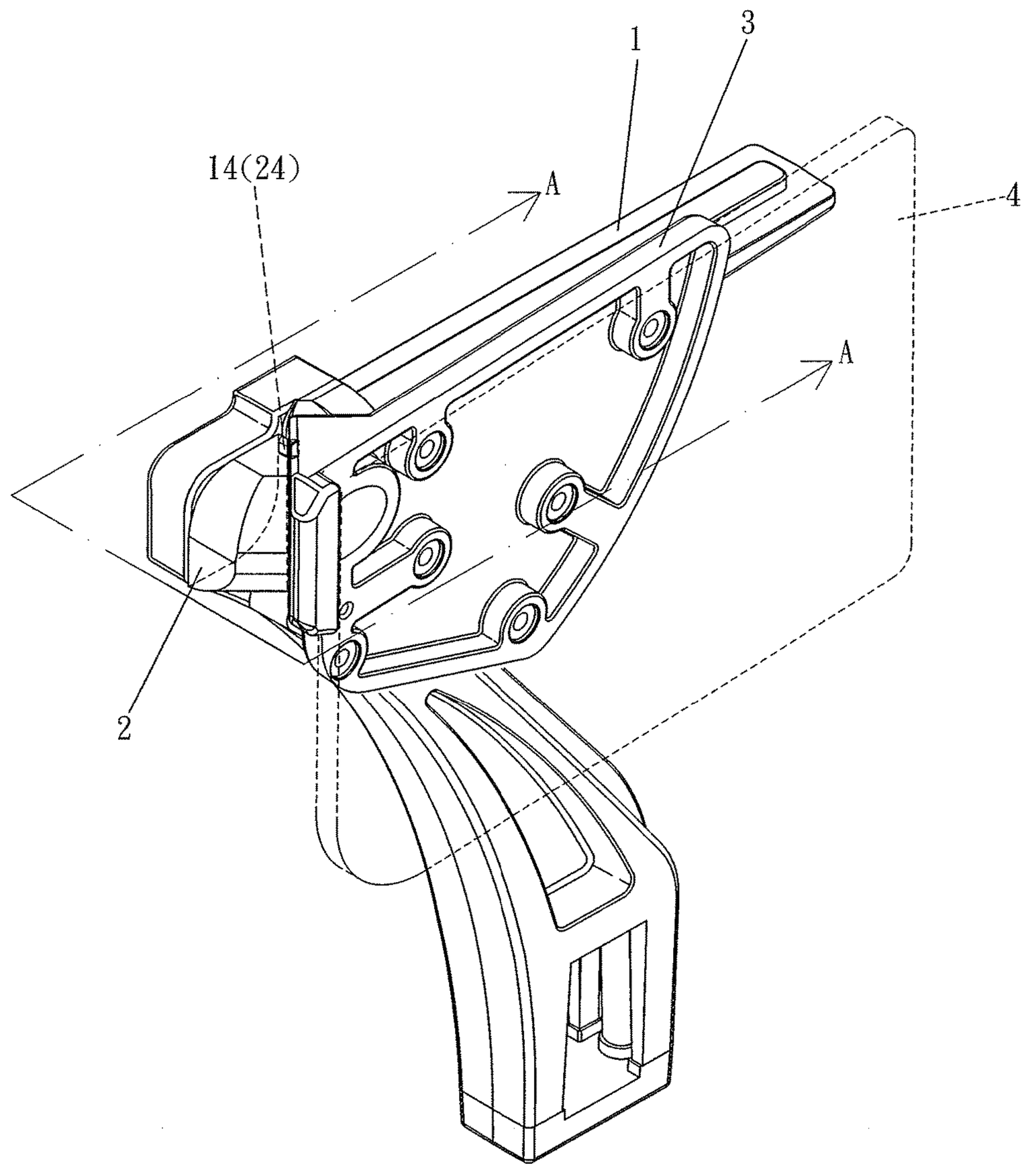
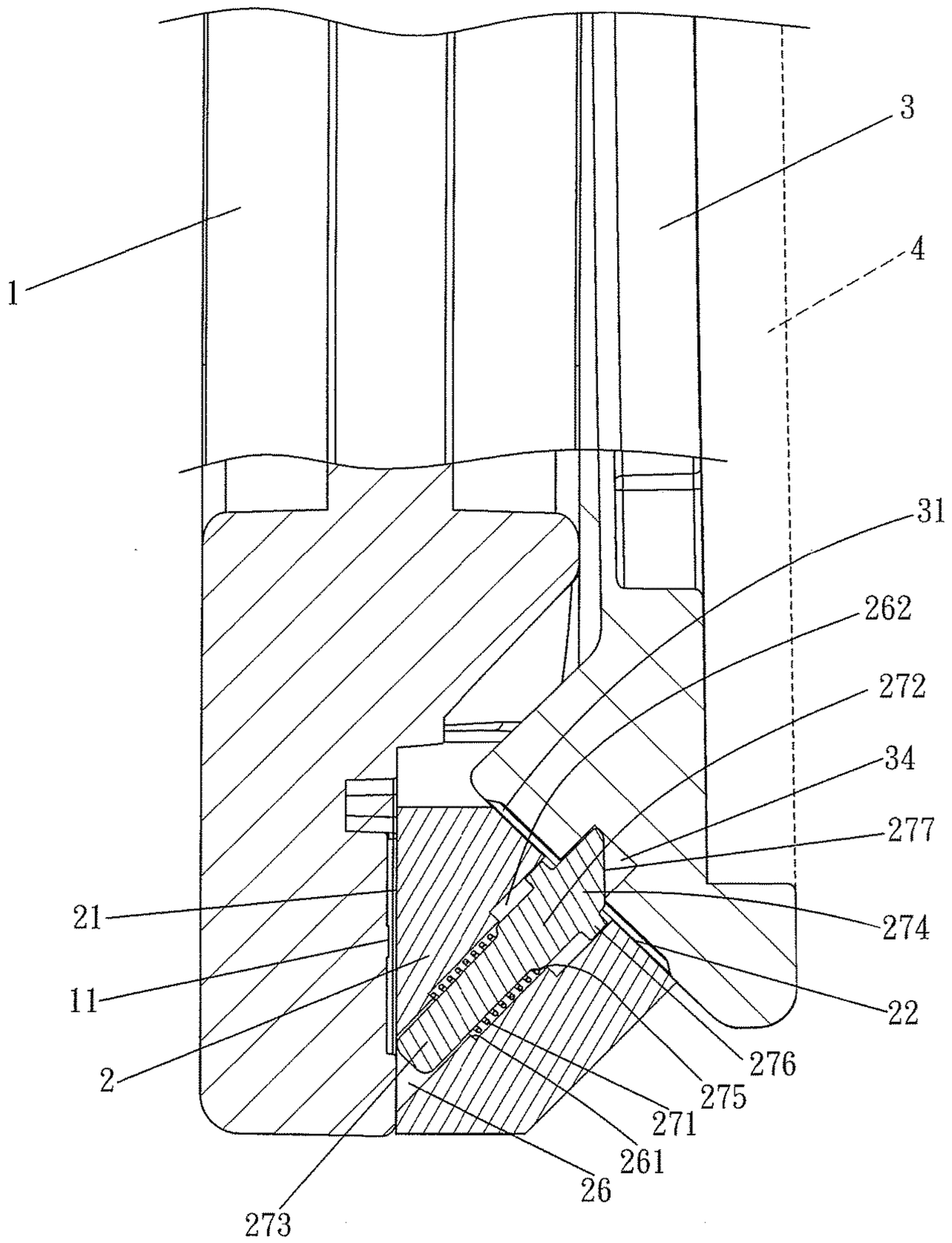


FIG.2



A - A

FIG. 3

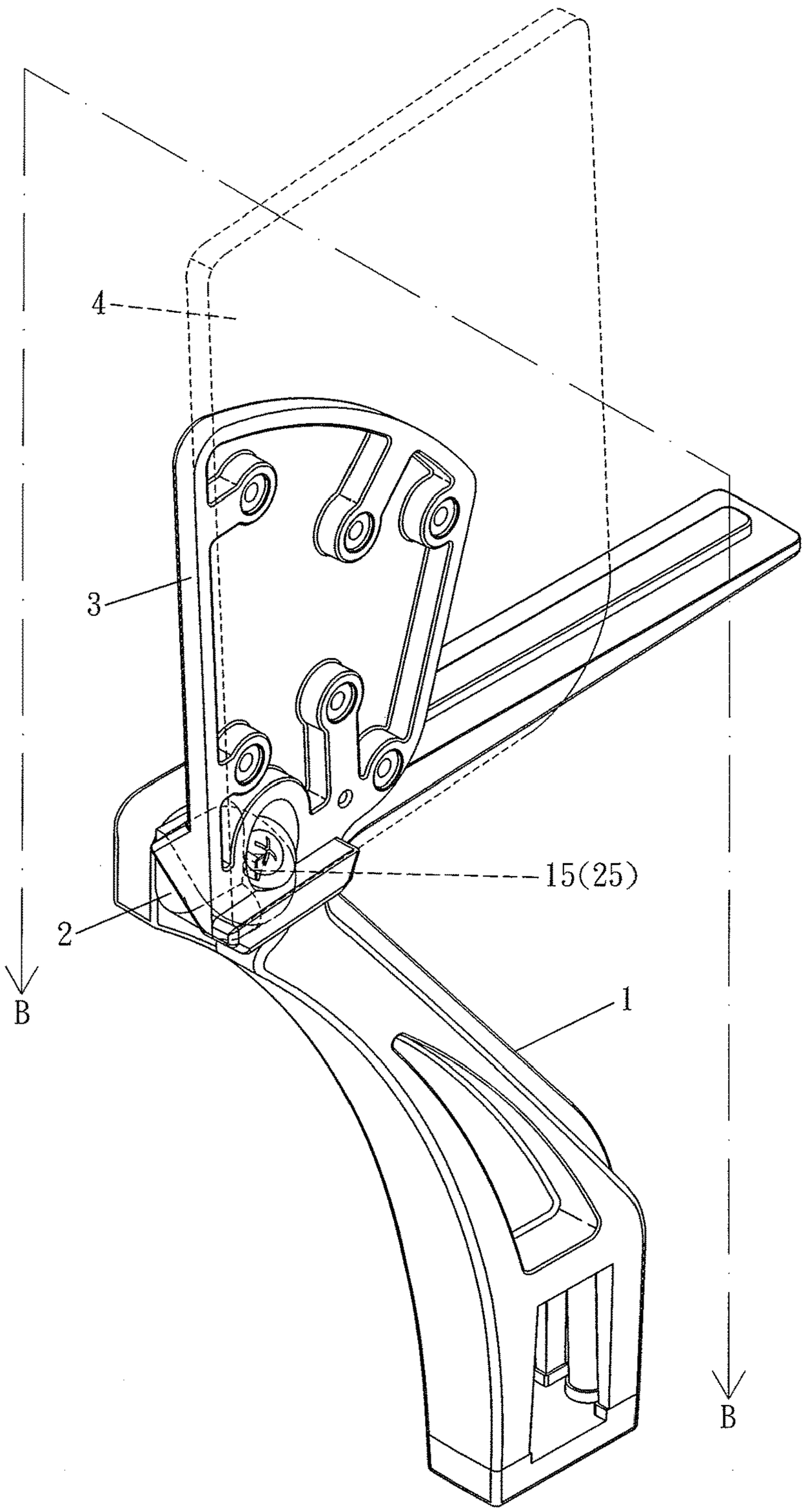
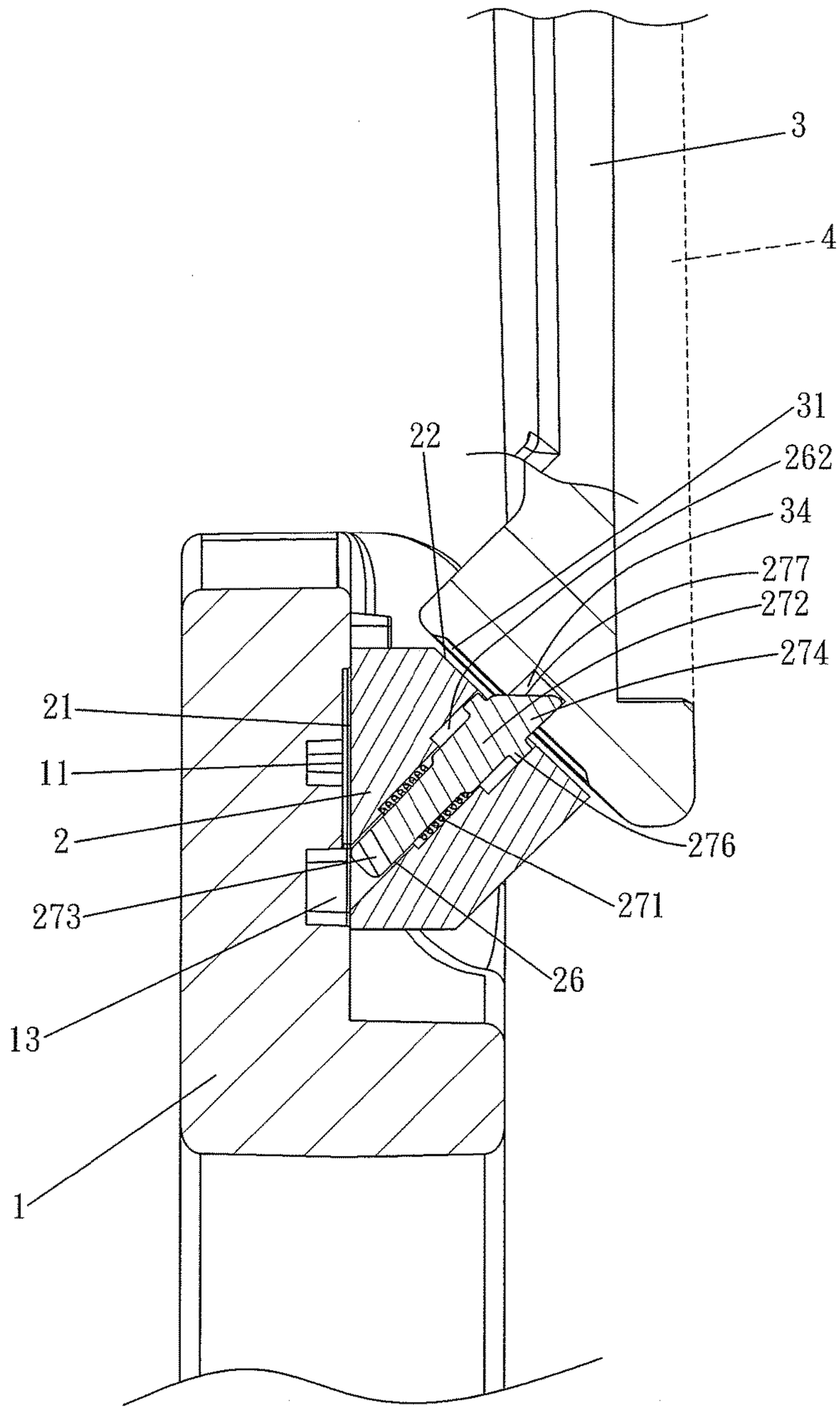


FIG.4



B - B

FIG.5

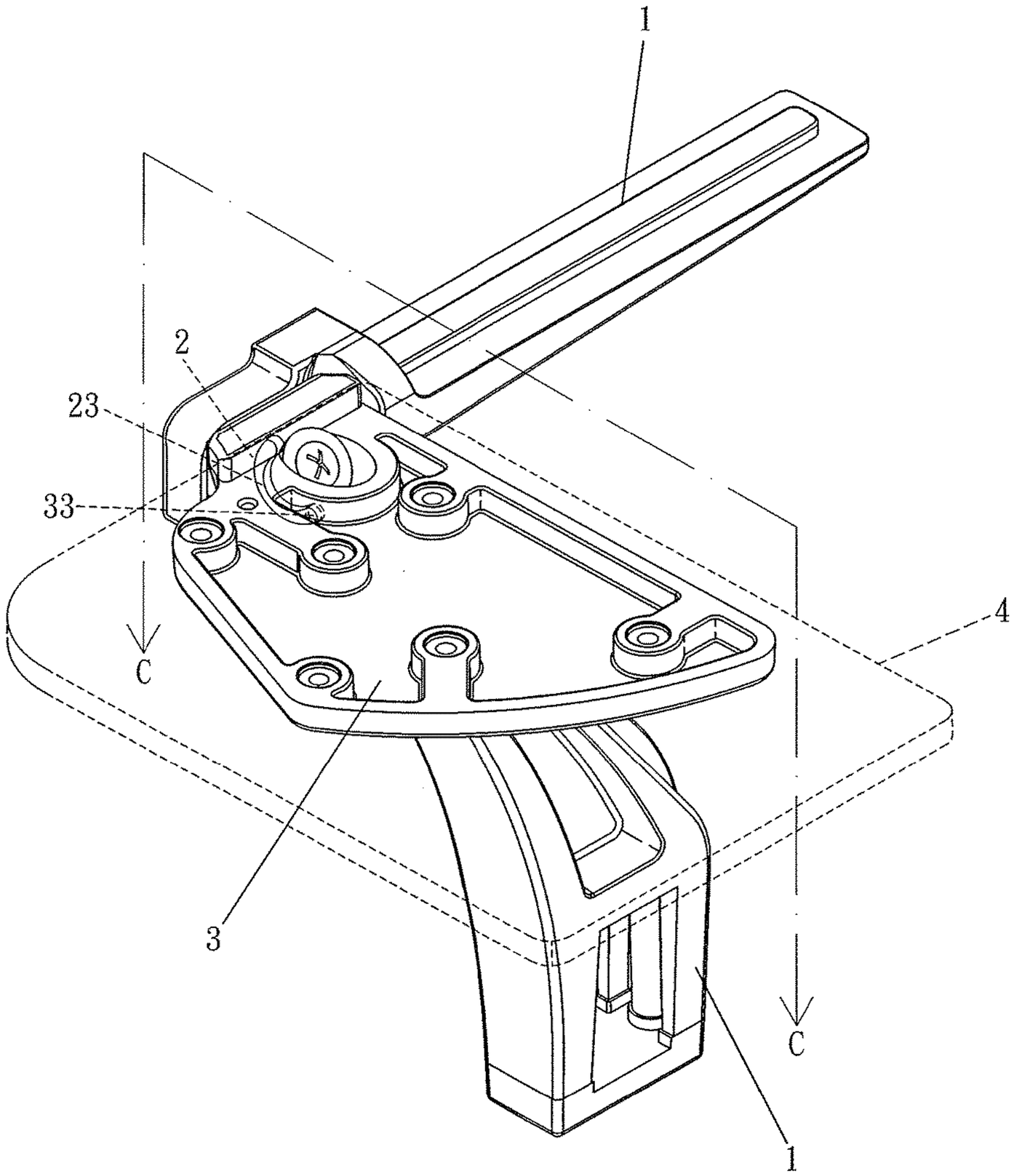
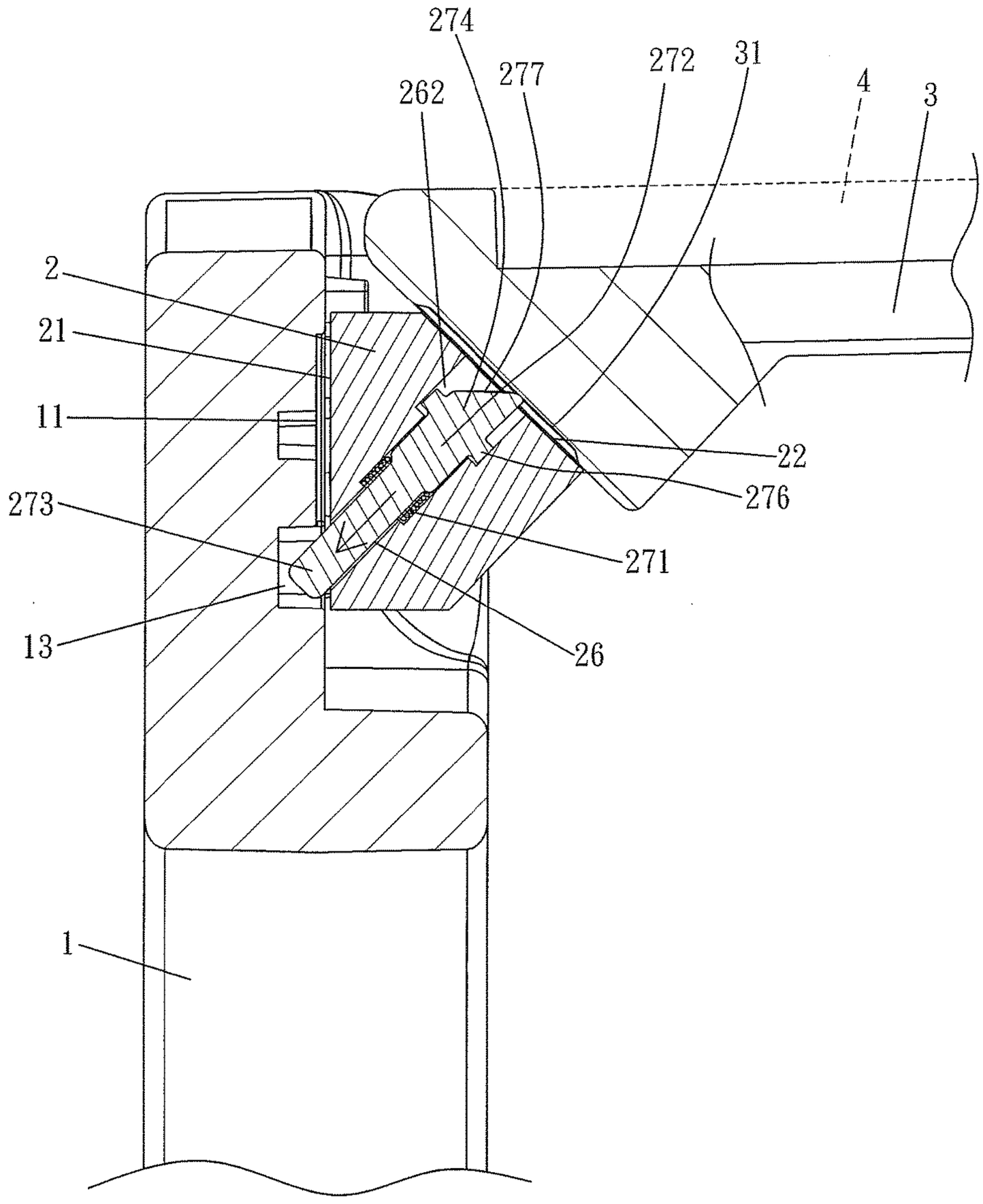
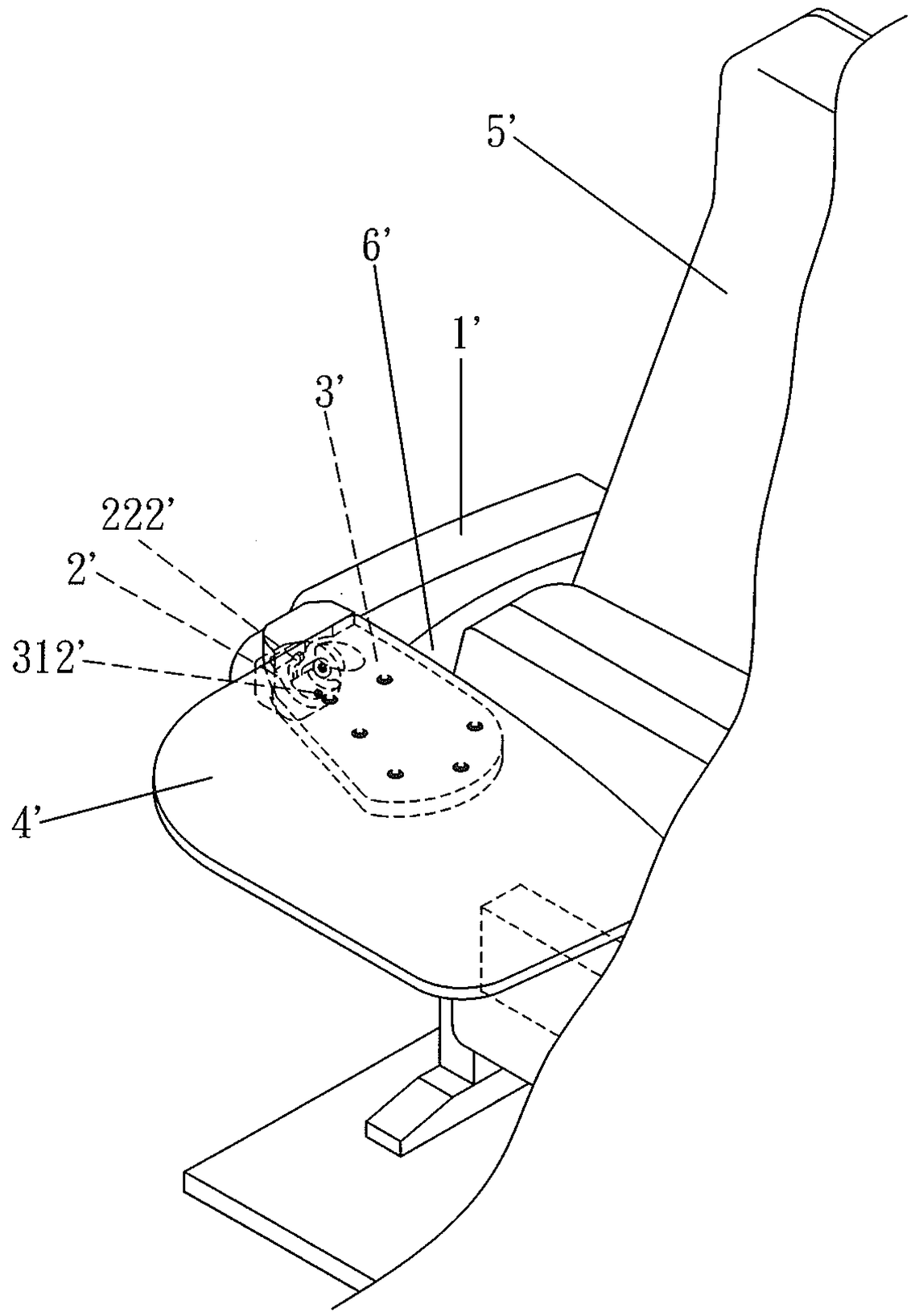


FIG.6

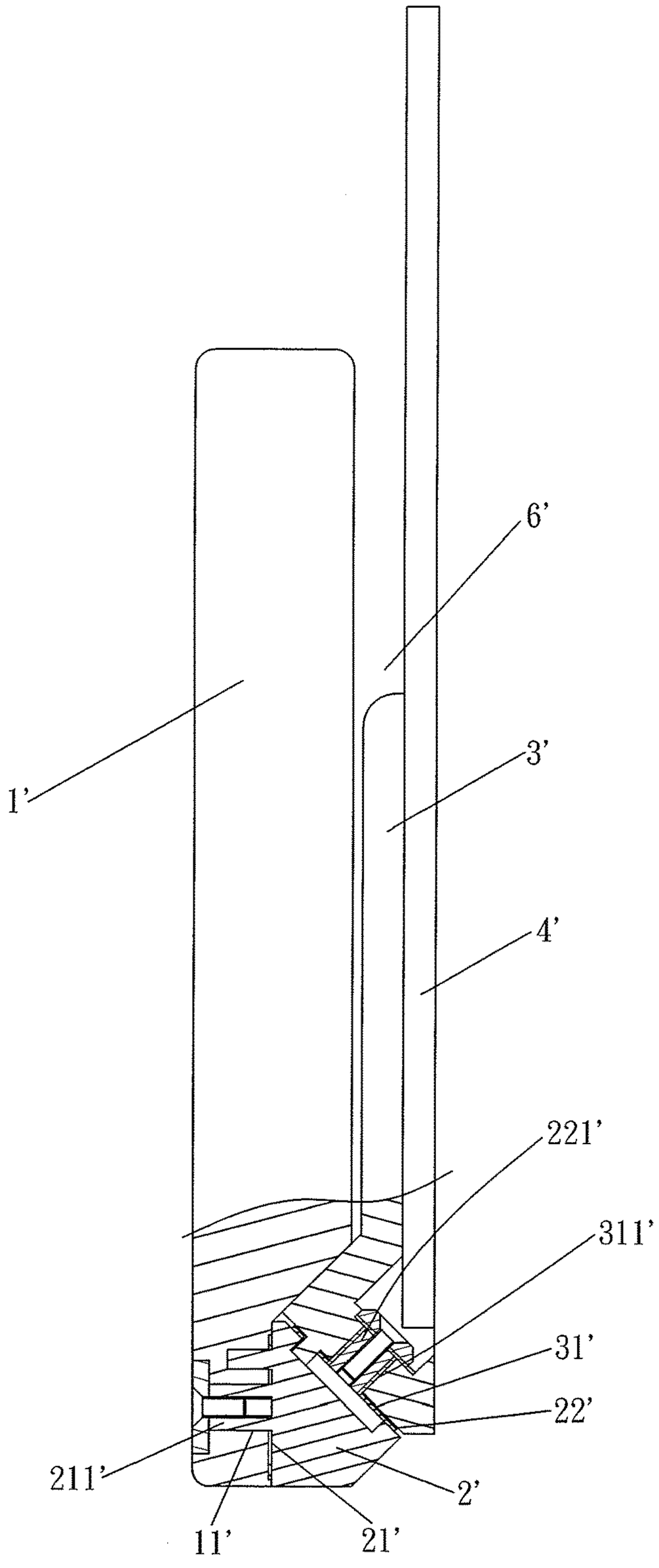


C - C

FIG.7

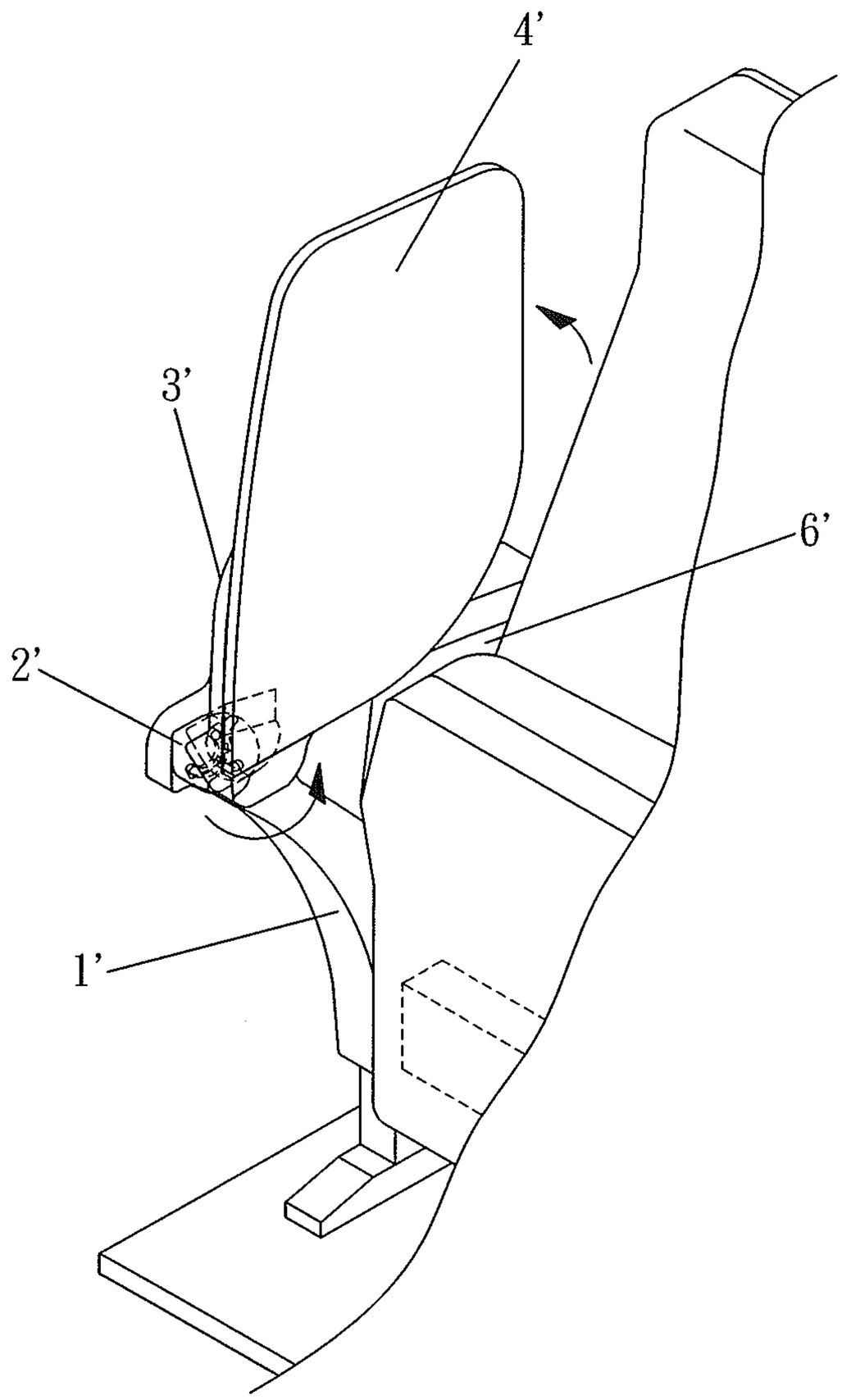


PRIOR ART
FIG.8

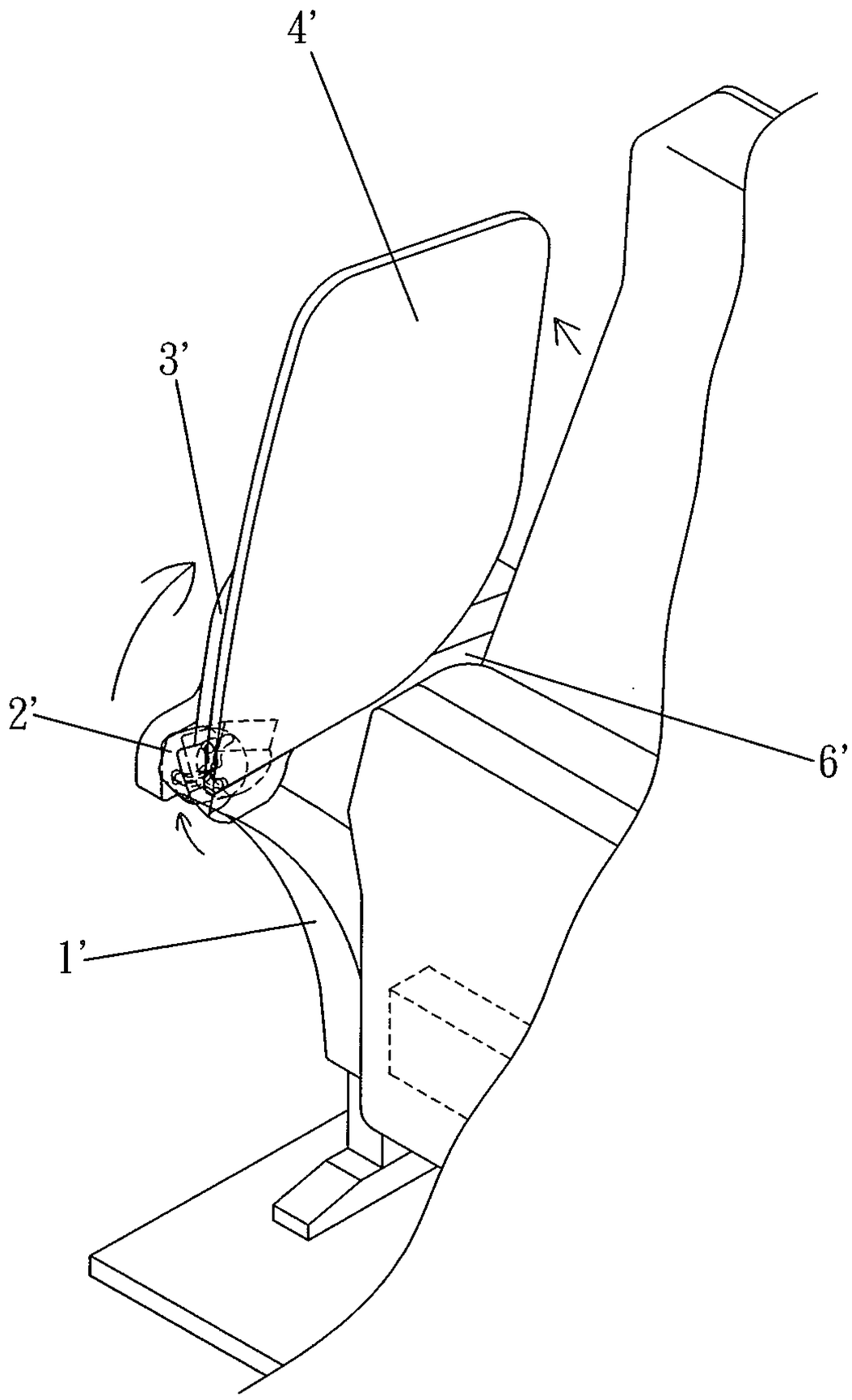


PRIOR ART

FIG. 9



PRIOR ART
FIG.10



PRIOR ART
FIG. 11

PIVOTABLE TOP BOARD DEVICE FOR A CHAIR

BACKGROUND OF THE INVENTION

The present invention relates to a pivotable top board device for a chair and, more particularly, to a pivotable top board device for a chair for increasing stability during unfolding and folding operations.

Chairs used in conference rooms, classrooms, etc. generally include a top board that can be unfolded for easy writing for a user or can be folded when the user leaves the chair.

FIGS. **8** and **9** show a conventional chair with a pivotable top board device including an armrest **1'**, an axle block **2'**, a coupling board **3'**, and a top board **4'**. A receiving space **6'** is defined between the armrest **1'** and a body **5'** of the chair. The armrest **1'** includes a pivotal hole **11'**. The axle block **2'** includes a first coupling face **21'** and a second coupling face **22'** at an angel of 45° to the first coupling face **21'**. Each of the first and second coupling faces **21'** and **22'** has a stub **211'**, **221'**. The stub **211'** extends into the pivotal hole **11'** to be pivotably connected to the armrest **1'**. A positioning groove **222'** is defined in the second coupling face **22'**. The coupling board **3'** includes a side having a coupling face **31'** at an angel of 45° to a top face of the coupling board **3'**. A pivotal hole **311'** is defined in the coupling face **31'** and pivotably receives the stub **221'** of the axle block **2'**. A protrusion **312'** is provided on the coupling face **31'** in a location corresponding to the positioning groove **222'**. The top board **4'** is fixed to the coupling board **3'**. When not in use, the top board **4'** can be pivoted into the receiving space **6'**. In use, the top board **4'** is lifted upward and pivots the axle block **2'** through an angle of 90° (see FIG. **10**). Then, the top board **4'** is pivoted relative to the axle block **2'** to an extended position shown in FIG. **8**, with the protrusion **312'** abutting against an edge of the positioning groove **222'**.

However, stable operation of the coupling board **3'** and the axle block **2'** cannot be supported by the pivotal arrangement therebetween. For example, as shown in FIG. **11**, the axle block **2'** is apt to pivot while the top board **4'** is being pivoted to the folded position, leading to deviation of the top board **4'** from the vertical direction. Thus, the angular position of the top board **4'** must be readjusted for the folding operation, which not only is inconvenient to folding but causes friction and wear between an edge of the top board **4'** and a surface of the armrest **1'**.

BRIEF SUMMARY OF THE INVENTION

An objective of the present invention is to provide a pivotable top board device for a chair for increasing stability during unfolding and folding operations.

A pivotable top board device for a chair according to the present invention includes an armrest having a coupling face with a first positioning hole. An axle block includes a first coupling face and a second coupling face at an angel of 45° to the first coupling face. The first coupling face of the axle block is pivotably coupled to the coupling face of the armrest. The axle block further includes a through-hole extending from the first coupling face through the second coupling face and having a longitudinal axis. A positioning device is received in the through-hole and includes an operation rod and an elastic element providing elasticity for moving the operation rod. The operation rod is received in the through-hole and includes a first positioning end and a second positioning end. The operation rod has a length along the longitudinal axis larger than a length of the through-hole along the longitudinal axis. A coupling board includes a top face and a coupling face at an angle of 45° to the top face. The second coupling face of the axle block is pivotably coupled to the coupling face of the coupling board. The coupling face of the coupling board includes a second positioning hole. A top board is fixed to the coupling board. The top board is pivotable to pivot the axle block, thereby proceeding with unfolding operation and folding operation of the top board.

The operation rod is movable in the through-hole along the longitudinal axis under action of the elastic element to move between a first position in which the first positioning end protrudes outside of the first coupling face to engage with the first positioning hole of the armrest and a second position in which the second positioning end protrudes outside of the second coupling face to engage with the second positioning hole of the coupling board.

In an example, the coupling face of the armrest includes a pivotal hole and two abutting portions respectively corresponding to the unfolding operation and the folding operation. The axle block further includes a first stub provided on the first coupling face and a second stub provided on the second coupling face. The first stub is received in the pivotal hole of the armrest and is secured by a fastener. The second coupling face includes an arcuate positioning groove. The axle block further includes two abutting sides for respectively abutting against the two abutting portions respectively corresponding to the unfolding operation and the folding operation. The coupling face of the coupling board further includes a pivotal hole that receives the second stub of the axle block and that is secured by another fastener. The coupling face of coupling board further includes a protrusion slideably received in the arcuate positioning groove.

In an example, the axle block includes a first shoulder provided on an inner periphery of the through-hole. The operation rod includes a second shoulder. The elastic element is mounted around the operation rod and includes a first end abutting the first shoulder and a second end abutting the second shoulder.

In an example, the axle block further includes a guiding groove defined in the inner periphery of the through-hole. The operation rod includes a flange slideably received in the guiding groove. The second positioning end of the operation rod includes an inclined guiding side.

The present invention will become clearer in light of the following detailed description of illustrative embodiments of this invention described in connection with the drawings.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is an exploded, perspective view of a pivotable top board device for a chair of an embodiment according to the present invention.

FIG. **2** is a perspective view of the pivotable top board device of FIG. **1**, with a top board of the pivotable top board device in a lower, vertical position.

FIG. **3** is a cross sectional view taken along section line A-A of FIG. **2**.

FIG. **4** is a perspective view of the pivotable top board device of FIG. **2**, with the top board in an upper, vertical position.

FIG. **5** is a cross sectional view taken along section line B-B of FIG. **4**.

FIG. **6** is a perspective view of the pivotable top board device of FIG. **1**, with the top board in a horizontal position.

FIG. **7** is a cross sectional view taken along section line C-C of FIG. **6**.

FIG. **8** is a partial, perspective view of a conventional chair with a pivotable top board, with the top board in an unfolded position.

FIG. **9** is a partly-cross sectioned side view of the conventional chair of FIG. **8**, with the top board in a folded position.

FIG. **10** is a partial, perspective view of the conventional chair of FIG. **8**, illustrating unfolding operation of the top board.

FIG. **11** is a partial, perspective view illustrating folding operation of the top board of the conventional chair of FIG. **8**.

DETAILED DESCRIPTION OF THE INVENTION

With reference to FIGS. **1-3**, a pivotable top board device for a chair of an embodiment according to the present invention includes an armrest **1**, an axle block **2**, a coupling board **3**, and a top board **4**. The armrest **1** includes a coupling face **11** having a pivotal hole **12** and a first positioning hole **13** spaced from the pivotal hole **12** in a radial direction. The coupling face **11** of the armrest **1** further includes two abutting portions **14** and **15**. The first positioning hole **13** is located between the pivotal hole **12** of the armrest **1** and the two abutting portions **14** and **15** respectively corresponding to unfolding operation and folding operation of the top board **4**.

The axle block **2** includes a first coupling face **21** and a second coupling face **22** at an angel of 45° to the first coupling face **21**. The axle block **2** further includes a first stub **211** provided on the first coupling face **21** and a second stub **221** provided on the second coupling face **22**. The first stub **211** is received in the pivotal hole **12** of the armrest **1** and is secured by a fastener **212**. Thus, the first coupling face **21** of the axle block **2** is pivotably coupled to the coupling face **11** of the armrest **1**. The second coupling face **22** includes an arcuate positioning groove **23**. The axle block **2** further includes two abutting sides **24** and **25** for respectively abutting against the two abutting portions **14** and **15** respectively corresponding to the unfolding operation and the folding operation.

The axle block **2** further includes a through-hole **26** extending from the first coupling face **21** through the second coupling face **22** and having a longitudinal axis. A positioning device **27** is received in the through-hole **26** and includes an operation rod **272** and an elastic element **271** providing elasticity for moving the operation rod **27**. The axle block **2** includes a first shoulder **261** provided on an inner periphery of the through-hole **26**. Furthermore, the axle block **2** includes a guiding groove **262** defined in in an end of the inner periphery of the through-hole **26**.

The operation rod **272** is received in the through-hole **26** and includes a first positioning end **273** and a second positioning end **274**. The operation rod **272** has a length along the longitudinal axis of the through-hole **26** larger than a length of the through-hole **26** along the longitudinal axis. The operation rod **272** includes a second shoulder **275**. The elastic element **271** is received in the through-hole **26**, is mounted around the operation rod **272**, and includes a first end abutting the first shoulder **26** and a second end abutting the second shoulder **275**. The operation rod **272** further includes a flange **276** slideably received in the guiding groove **262**. Thus, the operation rod **272** is slideable along the longitudinal axis under action of the elastic element **271** but is not rotatable about the longitudinal axis. Specifically, the operation rod **272** is movable in the through-hole **26** along the longitudinal axis under action of the elastic element **271** to move between a first position in which the first positioning end **273** protrudes outside of the first coupling face **21** to engage with the first positioning hole **13** of the armrest **1** and a second position in which the second positioning end **274** protrudes outside of the second coupling face **22** to engage with the second positioning hole **34** of the coupling board **3**. The second positioning end **274** of the operation rod **272** includes an inclined guiding side **277**.

The coupling board **3** includes a top face and a coupling face **31** at an angle of 45° to the top face. The coupling face **31** of the coupling board **3** includes a pivotal hole **32** that receives the second stub **221** of the axle block **2** and that is secured by another fastener **222**. Thus, the second coupling face **22** of the axle block **2** is pivotably coupled to the coupling face **31** of the coupling board **3**. The coupling face **31** of coupling board **3** further includes a protrusion **33** slideably received in the arcuate positioning groove **23**. The protrusion **33** of the coupling board **3** slides along the arcuate positioning groove **23** when the top board **4** moves between the folded position and the unfolded position. The coupling face **31** of the coupling board **3** includes a second positioning hole **34**. The top board **4** is fixed to the coupling board **3**.

With reference to FIGS. **2** and **3**, when the top board **4** is in the folded position, the top board **4** is at a side of the armrest **1**, and the second positioning end **274** of the operation rod **272** is biased by the elastic element **271** into the second positioning hole **34** of the coupling board **3**. In this case, the first positioning end **273** of the operation rod **272** is not aligned with the first positioning hole **13** of the armrest **1** and is received in the through-hole **26**. Thus, the coupling board **3** and the axle block **2** are coupled and jointly movable with each other. In this state, the protrusion **33** of the coupling board **3** is engaged in the arcuate positioning groove **23**.

With reference to FIGS. **4** and **5**, when it is desired to unfold, the top board **4** is pivoted 180° relative to the armrest **1** and pivots the axle block **2**. Furthermore, the abutting side **25** of the axle block **2** abuts against the abutting portion **15** of the armrest **1** to restrain rotation of the axle block **2**. At this time, the first positioning end **273** of the operation rod **272** is aligned with the first positioning hole **13** of the armrest **1**.

With reference to FIGS. **6** and **7**, when the top board **4** is flipped relative to the axle block **2** to a horizontal position, the second positioning hole **34** of the coupling board **3** disengages from the second positioning end **274** of the operation rod **272**. Furthermore, an edge of the second positioning hole **34** and the coupling face **31** of the coupling board **3** presses against the inclined guiding face **277** of the second positioning end **274** to move the operation rod **272** along the longitudinal axis, thereby moving the second positioning end **274** of the operation rod **272** into the through-hole **26**. The first positioning end **273** is moved into the first positioning hole **13** of the armrest **1**, and the elastic element **271** is compressed. Thus, the axle block **2** is securely engaged with the armrest **1** and, thus, will not pivot when the top board **4** is flipped. Furthermore, the protrusion **33** of the coupling board **3** moves relative to the arcuate positioning groove **23** until the protrusion **33** abuts an end of the arcuate positioning groove **23** to retain the top board **4** in the unfolded position. The positioning device **27** cooperates with the coupling board **3** and the armrest **1** to provide a more stable operation.

When it is desired to fold the top board **4** again, the top board **4** is flipped reversely from the position shown in FIG.

6 to the position shown in FIG. 4. Since the axle block 2 still engages with the armrest 1 and will not pivot together with the top board 4, the top board 4 can be flipped in a direction to the vertical direction at a side of the armrest. Then, the top board 4 is pivoted in a reverse direction to the position shown in FIG. 2. During the folding movement of the top board 4, the top board 4 is avoided from pressing against the armrest 1 to thereby avoid rubbing between the top board 4 and the surface of the armrest 1. Furthermore, since the second positioning hole 34 of the coupling board 3 is pivoted to a position aligned with the second positioning end 274 of the operation rod 272, the elastic element 271 elastically urges the second positioning end 274 of the operation rod 272 into the second positioning hole 34 of the coupling board 34, such that the coupling board 3 and the axle block 2 can move jointly again. Accordingly, the pivotable top board device according to the present invention provides improved stability for folding and unfolding operations.

Although specific embodiments have been illustrated and described, numerous modifications and variations are still possible without departing from the scope of the invention. The scope of the invention is limited by the accompanying claims.

The invention claimed is:

1. A pivotable top board device for a chair, comprising:

an armrest including a coupling face having a first positioning hole;

an axle block including a first coupling face and a second coupling face at an angle of 45° to the first coupling face, wherein the first coupling face of the axle block is pivotably coupled to the coupling face of the armrest, wherein the axle block further includes a through-hole extending from the first coupling face through the second coupling face and having a longitudinal axis, wherein a positioning device is received in the through-hole and includes an operation rod and an elastic element providing elasticity for moving the operation rod, wherein the operation rod is received in the through-hole and includes a first positioning end and a second positioning end, wherein the operation rod has a length along the longitudinal axis larger than a length of the through-hole along the longitudinal axis;

a coupling board including a top face and a coupling face at an angle of 45° to the top face, wherein the second coupling face of the axle block is pivotably connected to the coupling face of the coupling board, wherein the coupling face of the coupling board includes a second positioning hole;

a top board fixed to the coupling board, wherein the top board is pivotable to pivot the axle block, thereby proceeding with unfolding operation and folding operation of the top board;

wherein the operation rod is movable in the through-hole along the longitudinal axis under action of the elastic element to move between a first position in which the first positioning end protrudes outside of the first coupling face to engage with the first positioning hole of the armrest and a second position in which the second positioning end protrudes outside of the second coupling face to engage with the second positioning hole of the coupling board.

2. The pivotable top board device for the chair as claimed in claim 1, wherein the coupling face of the armrest includes a pivotal hole and two abutting portions respectively corresponding to the unfolding operation and the folding operation, wherein the axle block further includes a first stub provided on the first coupling face and a second stub provided on the second coupling face, wherein the first stub is received in the pivotal hole of the armrest and is secured by a fastener, wherein the second coupling face includes an arcuate positioning groove, wherein the axle block further includes two abutting sides for respectively abutting against the two abutting portions respectively corresponding to the unfolding operation and the folding operation, wherein the coupling face of the coupling board further includes a pivotal hole that receives the second stub of the axle block and that is secured by another fastener, wherein the coupling face of coupling board further includes a protrusion slideably received in the arcuate positioning groove.

3. The pivotable top board device for the chair as claimed in claim 1, wherein the axle block includes a first shoulder provided on an inner periphery of the through-hole, wherein the operation rod includes a second shoulder, wherein the elastic element is mounted around the operation rod and includes a first end abutting the first shoulder and a second end abutting the second shoulder.

4. The pivotable top board device for the chair as claimed in claim 3, wherein the axle block further includes a guiding groove defined in the inner periphery of the through-hole, wherein the operation rod includes a flange slideably received in the guiding groove, and wherein the second positioning end of the operation rod includes an inclined guiding side.

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